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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/588,899	08/09/2006	Masayasu Miyata	9319A-001819/US/NP	4040

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HARNESS, DICKEY & PIERCE, P.L.C.
P.O. BOX 828
BLOOMFIELD HILLS, MI 48303

EXAMINER	
CAO, PHAT X	
ART UNIT	PAPER NUMBER
2814	
MAIL DATE	DELIVERY MODE
01/04/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/588,899	MIYATA, MASAYASU	
	Examiner	Art Unit	
	Phat X. Cao	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 October 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4,5,7,10,13 and 14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4,5,7,10,13 and 14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/5/09*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The Request for Continued Examination filed on 10/26/09 is acknowledged.

2. The cancellation of claims 2-3, 6, 8-9, 11-12 and 15 in Paper filed on 10/26/09 is acknowledged.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1, 4-5, 7, 10, and 13-14 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

- Claim 1, the combination of the limitation "the gate insulating material having a first region where B/A is 10 or less" (lines 11-12) and the limitation "the gate insulating material having a second region where D/C is 1.6 or more" (line 15) is not supported by the original disclosure.
- Claim 1, the limitation "the gate insulating material having a second region where D/C is 1.6 or **more**" (line 15) is also not supported by the original disclosure. For example, page 18 of the original specification states that "B/A is 10 or less" but not more than 10 as claimed.

- Dependent claims 4-5, 7, 10 and 13-14 are also not supported by the original disclosure because they either directly or indirectly depend from independent claim 1.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 4, 7, 10 and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kusunoki et al (US 2002/0066934).

Regarding claims 1 and 4, Kusunoki (Fig. 11) discloses a semiconductor device comprising: a base 1 including a semiconductor material, the base 1 having a source region 6, a drain region 7 and a channel region 35 disposed between the source region 6 and the drain region 7; a gate insulating material 22 disposed in contact with the channel region 35 of the base 1; and a gate electrode 5 disposed on the gate insulating material 22; the gate insulating material 22 includes silicon, oxygen, hydrogen and nitrogen (par. [0074]), the gate insulating material 22 having a region where B/A is in a range of 10 or less (i.e., 1.2), a concentration of nitrogen in the region is defined as A= $2.5x10^{20}$ atoms/cm^3 or more and a concentration of hydrogen in the region is defined as B= $3x10^{20}$ atoms/cm^3 or more (par. [0074]),

the gate insulating material 22 having a second region where D/C is 1.2 or more, a concentration of nitrogen in the region is defined as C= $2.5x10^{20}$ atoms/cm^3 or more

and a concentration of hydrogen in the region is defined as D= $3x10^{20}$ atoms/cm^3 or more (par. [0074]), the second region is located at a portion of the gate insulating material 22 at a distance in a thickness direction of Y/10 of the gate insulating material from an interface between the channel region 35 of the gate insulating material 22 and the base 1, Y being an average thickness of the gate insulating material 22.

Kusunoki discloses that the value of the second region D/C is 1.2 or more but does not disclose that the value of the second region D/C is 1.6 or more as claimed.

However, there is no evidence of record to indicate that the value of the second region D/C of the gate insulating film being equal or higher than 1.6 will achieves unexpected results over the value of the second region D/C of the gate insulating film being equal 1.2. The examiner specifically notes page 19 (first paragraph) of Applicant's specification. This page states that "B/A ... more preferably it is 2 or less". This applicant's specification appears to support the examiner's position that the value of the second region D/C having value being equal or higher than 1.6 does not perform different than the value of the second region D/C having value being equal 1.2 as taught by Kusunoki. Furthermore, it has been held that a *prima facie* case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corporation of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to form the value of the second region D/C being 1.2 or more as

suggested by Kusunoki or 1.6 or more as claimed because the value of second region D/C can be optimized during routine experimentation by changing the concentration of nitrogen or hydrogen, and the same effects of improving an efficiency of injection of channel hot electrons and suppressing of an interface level would result (see par. [0026] of Kusunoki).

Regarding claim 7, Kusunoki (Fig. 11) further discloses that the gate insulating material is formed into a gate insulating film 22 and the average thickness of the gate insulating film 22 is 10nm (par. [0074]).

Regarding claim 10, it has been held that where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, claimed properties or functions are presumed to be inherent. *In re Best*, 195 USPQ 430, 433 (CCPA 1977). In this case, because the gate insulating film of claimed device and the gate insulating film of Kusunoki's device both have substantially identical in structure and composition, claimed property of having the maximum leakage current passing through the gate insulating film being 2X10^-8 A/cm2 or less when the electric filed intensity in the gate insulating film being 3 MV/cm is presumed to be inherent.

Regarding claims 13-14, Kusunoki further discloses that an electronic apparatus comprising an electronic device of flash EEPROM (see Fig. 54, and par. [0008]).

7. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kusunoki et al in view of Hori et al (US 6,215,163).

Kusunoki does not disclose the concentration of hydrogen and the concentration of nitrogen are measured by Secondary Ion Mass Spectrometry (SIMS).

It is noted that the process limitations (i.e., measured by means of Secondary Ion Mass Spectrometry) recited in a "product by process" claim would not carry patentable weight in a claim drawn to structure because distinct structure is not necessarily produced. *In re Thorpe*, 227 USPQ 964 (Fed. Cir. 1985). However, Hori teaches the known feature of using Secondary Ion Mass Spectrometry to measure the concentration of hydrogen and the concentration of nitrogen in the silicon oxynitride insulating layer (see Fig. 4 and column 8, lines 8-13).

Response to Arguments

8. Applicant's arguments filed 10/26/09 have been fully considered but they are not persuasive.

Applicant argues that Kusunoki teaches the RNO film 12 has a D/C value of a second region being less than 1.2 but does not teach the gate insulating material having a D/C value of a second region being 1.6 or more as amended.

This argument is not persuasive because the RNO film 12 is not relied on for teaching the gate insulating material having a second region as asserted by Applicant, but rather, the insulating film 22 (Fig. 11) is relied on for teaching the gate insulating material having a second region as claimed. It is clear that the gate insulating material 22 has a second region of D/C being 1.2 or more with a concentration of nitrogen in the region is defined as C= $2.5x10^{20}$ atoms/cm^3 or more and a concentration of hydrogen in the region is defined as D= $3x10^{20}$ atoms/cm^3 or more (par. [0074]). Therefore, the gate

insulating material 22 of Kusunoki does suggest the invention as claimed (see ground of rejection for more details). Furthermore, the limitation "the gate insulating material having a second region where D/C is 1.6 or more" is not supported by the original disclosure (see more details in ground of rejection under 112-1st paragraph).

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is (571)272-1703. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571)272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/P. X. C./
Primary Examiner, Art Unit 2814

/Phat X. Cao/
Primary Examiner, Art Unit 2814